REMARKS

Claims 1, 3, 4 and 6 have been rejected by the Examiner under 35 USC 103(a) as being unpatentable over Stuhldreher, U.S. Patent 6,080,809 in view of Fukumoto, U.S. Patent 5,591,794. Claims 1, 3, 4 and 6 have been further rejected by the Examiner under 35 USC 103(a) as being unpatentable over Hergenrother, U.S. Patent 6,342,552. These rejections are respectfully traversed.

The present invention is directed to a rubber composition for tire treads which significantly improves the wet skid performance (grip performance on wet roads) without decreasing the abrasion resistance and rolling resistance of the tire. This advantageous result can be obtained by providing a rubber composition with the following components:

1. rubber containing at least 35% by weight of a styrene-butadiene rubber;
2. 5 to 50 parts by weight of clay having a particle size of 0.5 to 10 μm;
3. at least 5 parts by weight of silica; and
4. at least one part by weight of carbon black, wherein the total amount of clay and silica is present in an amount of at least 30 parts by weight and a total amount of clay, silica and carbon black is present in an amount of at most 100 parts by weight.

The specific amounts of SBR clay having a particle size of 0.5 to 10 μm, silica and carbon black are important for the reasons set forth in the specification of the present application.

Thus, the rubber component advantageously contains at least 35% by weight of styrene-butadiene rubber. As noted on page 4 of the present application, a diene rubber containing less than 35% by weight of styrene-butadiene rubber shows a decrease in processability at tire production and does not render low fuel consumption compatible with wet grip performance.

The clay component of the rubber composition has a particle size of 0.5 to 10 μm and is present in an amount of 5 to 50 parts by weight. As noted at the top of page 5 of the present application, if the clay component is present in an amount of less than 5 parts by weight, a low improvement effect in wet grip performance is experienced and if the clay is present in an amount of more than 50 parts by weight, a decrease in abrasion resistance is also experienced.

As noted at the bottom of page 5 of the present application, the rubber composition of the present invention contains silica in an amount of at least 5 parts by weight, preferably 5 to 85 parts by weight based on 100 parts by weight of the rubber component. If the silica is present in the rubber composition in an amount of less than 5 parts by weight, a sufficient reinforcing effect and a decrease in the rolling resistance cannot be shown. On the other hand, if the silica component is present in an amount of more than 85 parts by weight, an increase in the heat buildup characteristic and a decrease in processability are experienced.

The rubber composition of the present invention also contains carbon black in an amount of at least one part by weight, preferably 1 to 70 parts by weight based on the rubber component. If the carbon black is present in an

amount of less than one part by weight, a low reinforcing performance and a decrease in abrasion resistance can be noted. If the carbon black is present in an amount of more than 70 parts by weight, a low dispersability is experienced (see page 6 of the present application).

It should also be noted that the total amount of the clay and silica components is present in an amount of at least 30 parts by weight, preferably 30 to 99 parts by weight based on 100 parts by weight of the rubber component. If the amount of the clay and silica is less than 30 parts by weight, the desired reinforcing effect cannot be achieved. If the clay and silica are present in amount of more than 99 parts by weight, a decrease in dispersability and an increase in the heat buildup characteristic are experienced.

The rubber composition of the present invention contains the clay, silica, and carbon black components in an amount of 31 to 100 parts by weight based upon 100 parts by weight of the rubber component. If the total amount of these components is less than 31 parts by weight, a sufficient reinforcing effect cannot be achieved. On the other hand, if the total amount of these components is more than 100 parts by weight, a decrease in dispersability and an increase in the heat buildup characteristic is experienced.

Thus, the desired effect of the present invention, that is, to significantly improve wet skid performance without decreasing abrasion resistance and without increasing the rolling resistance can be obtained when the rubber component contains styrene-butadiene rubber, clay having a particle size 0.5

to 10 μm, silica and carbon black, all of which are present in specific amounts. The Stuhldreher reference is directed to a method for decreasing dynamic modulus without decreasing the hardness in silica tread compounds in tires. The tread composition comprises an elastomer, including the high performance-enhancing package comprising silica, carbon black and a silica replacement. The replacement, which can replace up to about 40% by weight of the silica, is kaolin clay, which is present in conjunction with a silane coupling agent. As noted in Col. 2, lines 15-18 of the referenced patent, the kaolin clay has a medium particle size of about 0.2 μm, which falls outside of the particle size range of 0.5 to 10 μm as recited in claim 1 of the present application. Thus, not only does the amount of clay which is utilized in the referenced patent fall outside of the range recited in claim 1 of the present application, but in addition, the patentee does not recognize the fact that clay having too small of an average particle size would readily agglomerate, and thus render it difficult to be dispersed in rubber components. Accordingly, the referenced patent does not contemplate the Applicants' inventive contribution.

The Examiner has further relied upon the Fukumoto reference to teach that the clay component that is utilized in making tire treads has a particle size of 1 micron. However, the Fukumoto et al reference, U.S. Patent 5,591,794 differs from the present invention in that in the working examples of the reference patent, styrene butadiene rubber and silica are not used and furthermore the total amount of clay and silica is at most 30 parts by weight

(in fact 9 to 19 parts by weight as can be seen in Table 3) based on 100 parts by weight of the rubber component.

The present invention was accomplished from the findings that even if the particle size of clay is 0.5 to 10 μm, when the amount of silica is less than 5 parts by weight, the reinforcing effect and the effect of decreasing rolling resistance are insufficient (see page 5, lines 21-23 of the present application) and also when the total amount of clay and silica is less than 30 parts by weight, the reinforcing effect is insufficient (see page 6, lines 17-18 of the present application). This is also apparent from comparative examples 4 and 5 of the present application. That is, even though clay having a particle size of 0.5 to 10 μm is used, the rubber composition in which the total amount of clay and silica is 20 parts by weight (Comparative Examples 4 and 5) is significantly inferior in rolling resistance and wet skid resistance, when compared to Examples 1 to 4 wherein the total amount of clay and silica is at least 30 parts by weight.

The Hergenrother et al. reference does not disclose that the clay which is utilized therein has a particular average particle size. Such being the case, the referenced patent cannot possibly contemplate that the particle size of the clay component of the rubber composition is an important feature in providing a rubber composition having the properties referred to on pages 4 and 5 of the present application as discussed hereinabove.

The effect of the present invention of significantly improving the wet skid performance without decreasing the abrasion resistance and increasing the

rolling resistance of a tire can be obtained when the rubber component contains styrene butadiene rubber, clay having a particle size of 0.5 to 10μm, silica and carbon black which are compounded together in specific amounts. These advantageous results achieved by the present invention cannot be achieved from any possible combination of the Stuhldreher, Fukumoto or Hergentrother et al. references which are directed to improving dynamic modulus and processability. Accordingly, in view of the above remarks, reconsideration of the rejections and allowance of the claims in the present application are respectfully requested. In the event that the Request for Reconsideration does not place the present application into condition for allowance, entry thereof is respectfully requested to place the present application in better condition for appeal.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact Mr. Joseph A. Kolasch (Reg. No. 22,463) at the telephone number of the undersigned below, to conduct an interview in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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